REMARKS

Applicant has thoroughly considered the Examiner's remarks in the December 13, 2004 Final Office action and presents claims 1-60 for further examination. Applicant has amended the specification to correct minor typographical errors. This Amendment B also amends claims 1, 2, 18, 19, 52, and 53. Applicant respectfully requests reconsideration of the claims in view of the following remarks.

Response to Claim Rejection under 35 U.S.C. § 102(e)

Claims 1-11, 13, 14, 18-24, 29-32, 34-36, 38, 39, 43, 48-50, and 52-58 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Shah et al. (U.S. Patent Application Publication No. 2002/0099692) ("Shah reference"). Applicant submits that each and every element as set forth in the recited claims is not found, either expressly or inherently, in the Shah reference because it fails to teach or suggest horizontal partitioning of dimensions as set forth in the claims and described in the present application. Thus, the Shah reference does not anticipate the claims.[1]

As discussed previously, Applicant disagrees with the reading of Shah reference provided by the Office. For instance, in paragraph 39, the Shah reference teaches "aggregate fact tables are built for **frequently accessed data**, in a manner that reduces table size, join complexity, a query time. For example, sales figures might be accumulated at the "day" level in one aggregate fact table 130, and summarized more highly to the "month" level in some other aggregate fact table 130. The stargroup used for accessing sales figures might contain two stars 300, possibly **using exactly the same dimension tables 125b** but each pointing to different aggregate fact tables 130." That is, the Shah reference teaches away from modifying structures of dimension tables generally and horizontally partitioning a dimension particularly. In other words, these aggregate fact tables 310 provide **pre-aggregated** fact tables such that different aggregate fact

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[1] *See Verdegaal Bros., Inc. v. Union Oil Co. of Cal.*, 814 F.2d 628, 631 (Fed. Cir. 1987) (A claim is anticipated only if each and every element as set forth in the claim is disclosed, either expressly or inherently in a single prior art reference).

tables provide different levels of a same dimension (e.g., by "day" level or by "month" level). The dimension tables are exactly the same across different aggregate fact tables. Yet, the Shah reference is silent with respect to partitioning dimension tables.

Also, in calculating a metric at an analytical server, the Shah reference teaches **selecting** a star and **comparing** the requested level for each dimension with the supported levels of the dimensions, and not **partitioning** the dimensions based on a selected member of the upper level of the general dimension, as recited in claim 1. In paragraph 52, the Shah reference states that

> "...the analytical server 120 **selects** (step 625) the star 300 associated with the most highly aggregated fact table 130 and determines whether the star **supports each constrained dimension at the level required** (emphasis added). The foregoing is measured by **comparing** (step 630) the requested level for each dimension in the metric request with the array 310 of dimension indicators 315 describing the supported levels 210 of the dimensions. Wherein the array 310 indicates that the requested level for each dimension is supported at the same or higher level, the star 300 is selected (step 630)."

In other words, to calculate a metric, the Shah reference first **selects** a star with the most highly aggregated fact table to determine whether the star supports each constrained dimension at the level required. Next, it **compares** the requested level for each dimension in the metric request with the supported levels of the dimensions. Using the sales figure accumulation in the Shah reference as an example, if a user is interested in looking at the "quarter" level in the "TIME" dimension, the system in the Shah reference would look for an aggregate fact table that supports "quarter" level. If another query requests "week" level, the system in the Shah reference would search for an aggregate fact table that supports "week" level in the "TIME" dimension. However, these two aggregate fact tables, although supporting different levels of the "TIME" dimension, would still use the same "TIME" dimension, i.e., including all members in the "TIME" dimension even though these two aggregate fact tables support different levels. The Shah reference merely uses the structure of existing dimension to calculate a metric and fails to teach or suggest horizontally **partitioning** of the dimensions, the structures that organize the metrics.

In contrast to the Shah reference, claim 1 of the present invention recites, in part, "a detail cube, said detail cube including a **horizontally partitioned** dimension containing **a first subset** of the members of at least one lower level of the general dimension, said lower level associated with the horizontally partitioned dimension is lower in the hierarchy than the upper level

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associated with the summary cube and that the general dimension is partitioned based on a selected member of the upper level to form the horizontally partitioned dimension. . ." That is, by partitioning dimensions horizontally, a detail cube contains a first subset of at least one lower level of the general dimension.

Using star 300 in FIG. 3A and calculating sales figure accumulation in the Shah reference as an example, the present invention would partition the "TIME" dimension table 125b to a detail cube containing members only in the "week" level if a desired result only requests a sales figure at least on the "week" level. That is, the detail cube would not include members in higher levels above "week" level (e.g., year, quarter, or month). As such, the detail cube contains a subset of the general dimension (i.e. only members in the subset of "week" level). On the other hand, using the same example, the Shah reference teaches building aggregate fact tables supporting the "week" level. In responding to a query, however, the Shah reference searches all members of the "TIME" dimension, not just members in the "week" level during the query. (See also, paragraph 54 of the Shah reference.) Because aggregate fact tables do not partition "TIME" dimension table 125b, they merely provide different availability of dimension table levels. Thus, the present invention, by horizontally partitioning dimensions, reduces the total number of members that need to be searched and avoids querying levels in the dimension table that are not desired by the end user.

Hence, according to one aspect of the present invention, the benefit of horizontal partitioning of dimensions permits a multidimensional database to be organized into summary cubes and detail cubes so that querying or calculating the metrics of data in these databases can be done efficiently. As explained in the application, the summary-detail cube architecture is particularly beneficial for processing large dimensions in a large-scale, enterprise implementation of an OLAP application and provides improved scalability for the application on the server side and improved usability for users on the client side (See also paragraphs 31 and 32 on page 9-10 of the Application). Instead of having aggregate fact tables accessing the same dimension tables, the present invention provide summary-detail cubes that provide efficiency. The Shah reference is entirely silent as to the summary-detail cube architecture set forth in claim 1.

Furthermore, even though the Shah reference discloses a database organized into fact tables and dimension tables, which further include multiple levels of hierarchy (See Shah et al.,

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FIGS. 1-3A), it is entirely silent as to a dimension that is *horizontally partitioned* based on a selected member of an upper level of a general dimension. Particularly, the Shah reference fails to disclose *partitioning* of one or more dimensions to improve the processing of large dimensions and user navigation experience. Instead, the Shah reference discusses the use of various aggregate fact tables which are built for frequently accessed data. While these pre-aggregated fact tables of the Shah reference support different levels of a dimension, the aggregate fact tables, and the Shah reference as a whole, fail to disclose or suggest a dimension is being partitioned. Instead, the Shah reference teaches an analytical server would still need to traverse all levels in a dimension even though analysis of data in the lower levels only is of interest. Moreover, not only does the Shah reference fail to disclose or teach the *dimension-based partitioning* of the present invention, it also fails to disclose or teach a *summary cube* including members of at least one upper level of the general dimension such that the lower level associated with the partitioned dimension is lower in the hierarchy than the upper level associated with the summary cube or a corresponding detail cube.

Applicant also notes that contrary to the Final Office action, paragraph 6 of the Shah reference merely describes a database structure with fact and dimension tables, a star schema, aggregate fact tables and metadata. In particular, paragraph 6 discloses aggregate fact tables may also be provided which aggregate measures from the base fact table at a higher hierarchical level than such measures are maintained in the base fact table. Such discussion continues to fail to teach or suggest *horizontal partitioning* of dimension tables and/or that dimension tables would be partitioned by the use of aggregate fact tables.

Notwithstanding the Examiner's assertions, Applicant submits paragraph 53 of the Shah reference merely describes a step of metric calculation. In particular, paragraph 53 of the Shah reference teaches that when a level of dimensions requested by a user or a lower level is not supported, the fact table associated with a star is rejected, and a determination is made whether any remaining stars are present in a stargroup. Paragraph 53 of the Shah reference further teaches that when a remaining star exists in the stargroup, the star associated with the next most highly aggregated table is selected and that when there are no remaining stars, data may not be obtained for the particular

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measure. The reference fails to explain how such a determination as to if a star is present in a stargroup relates to the *dimension-based partitioning* of the present invention.

Likewise, paragraph 91 of the Shah reference also fails to show *partitioning* a dimension based on a selected member of a particular level of the dimension as set forth in the claims. In contrast, the cited reference merely discloses a graphical user interface (GUI) that includes a hierarchical listing of each of the dimensions. Particularly, paragraph 91 of the Shah reference teaches that a user can click on a particular dimension in the GUI and view metrics calculated for a constraint as well as the lower levels of the dimension hierarchy. Again, even though paragraph 91 of Shah shows a dimension organized into multiple levels of hierarchy, it fails to disclose or teach horizontal *partitioning* of a dimension based on a selected member of a particular level of the dimension as set forth in the claims.

In light of the above, Applicant submits that Shah reference fails to disclose each and every element of claim 1. Accordingly, claim 1 is believed to be allowable over such art.

Claims 2-17 depend from claim 1 and are believed to be allowable over the Shah reference for at least the same reasons that claim 1 is allowable over such art.

Claim 18 recites *"horizontally partitioning at least one of the dimensions based on a selected member of an upper level of the dimension to be partitioned"* as well as the combination of defining both a summary cube and a detail cube, which is unique in the art to the present invention. Therefore, claim 18 is allowable over the cited art. Claims 19-43 depend from the patentable method of claim 18 and, thus, are likewise believed to be allowable.

In contrast to the prior art, claim 48 recites the patentable combination of a summary cube database component, detail cube database component, and partitioned dimension component. According to this claim, the "subset of the members of the lower level [is] *partitioned from the dimension based on a selected member of the upper level"* and the " lower level associated with the partitioned dimension component [is] lower in the hierarchy than the upper level associated with the summary cube database component." In addition, claim 48 further recites *"a navigation component for implementing zoom in/zoom out events to navigate between information in the summary cube database component and information in the detail cube database component."* Although the Office action refers to Figure 3A of the Shah reference as disclosing this aspect of the invention, the cited reference merely illustrates a

conventional star schema of a fact table and dimension tables. The reference fails to show how such a star schema relates to a navigation component for implementing zoom in/zoom out events, as recited in claim 48. Because the Shah reference is entirely silent as to these aspects of the claimed invention, claim 48 is believed to be allowable. Claims 49-51 depend from claim 48 and are allowable for at least the same reasons as claim 48.

Claim 52 recites *"horizontally partitioning the target dimension based on a selected member of the service level"* in combination with defining a detail cube and defining a summary cube. Again, Applicant submits that the Shah reference fails to disclose or teach the *dimension-based partitioning* of claims 18, 48, and 52. Moreover, claim 52 recites that the *"target dimension contain[s] members of a plurality of levels"* and that the *"levels includ[e] a service level containing members representative of a plurality of Web services."* Applicant submits that Shah fails to teach or suggest that the levels of the target dimension include a service level containing members representative of a plurality of Web services. Therefore, claim 52 and its dependent claims 53-60 are patentable over the cited art.

Response to Claim Rejection under 35 U.S.C. § 103(a)

Claims 12, 15-17, 25-28, 37, 40-42, 44-47, 59, and 60 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Shah reference in view of Pitts et al. (U.S. Patent Publication No. 2003/0115194). Applicant respectfully disagrees. In any case, Applicant submits herewith evidence (Exhibit A) accompanying a declaration under 37 C.F.R. 1.131 that establishes Applicant's prior invention. In particular, the evidence shows a reduction to practice of the claimed invention before the effective filing date of the Pitts reference. Therefore, this reference must be removed from consideration and the claims allowed.

Claims 33 and 51 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Shah reference in view of Wong et al., U.S. Patent No. 6,708,172 ("Wong reference"). As previously discussed, the Shah and Wong references are wholly unrelated. Shah reference involves various structures within a database while Wong reference involves a web browsing environment that provides a graphical spatial context to associate websites to one another.

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Because the cited references are a mere aggregation based on hindsight analysis of the claims[2], and neither reference suggests the applicability of Wong reference to a database system, the Final Office action fails to establish the prima facie elements of an obviousness rejection. Therefore, such rejection under 35 U.S.C. § 103(a) must be withdrawn. In any event, claim 33 depends from claim 18 and claim 51 depends from claim 48. Accordingly, claims 33 and 51 are believed to be allowable for at least the same reasons as claims 18 and 48.

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[2] *See In re Oetiker*, 977 F.2d 1443, 1447 (Fed. Cir. 1992) ("There must be some reason, suggestion, or motivation found in the prior art whereby a person of ordinary skill in the field of the invention would make the combination. That knowledge can not come from the applicant's invention itself.").

CONCLUSION

It is felt that a full and complete response has been made to the Final Office action and, as such, places the application in condition for allowance. Such allowance is hereby respectfully requested. If the Examiner feels, for any reason, that a personal interview will expedite the prosecution of this application, he is invited to telephone the undersigned.

Applicant does not believe that a fee is due. If, however, the Commissioner determines otherwise, such fees may be charged during the entire pendency of this application to Deposit Account No. 19-1345.

Respectfully submitted,

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